MISB MOTION IMAGERY STANDARDS BOARD	MISB STD 0902.1
Standard	**9 June 2010**
Motion Imagery Sensor Minimum Metadata Set	

1 Scope

This Standard defines the MISB Minimum Metadata Set (MMS) and provides direction on the encoding of the MMS for transmission from analog systems while supporting a migration path towards digital motion imagery systems.

2 References

MISP 5.1, *Motion Imagery Standards Profile Version 5.1,* 11 December 2008.

SMPTE 336M-2007, *Data Encoding Protocol Using Key-Length-Value*

MISB Standard 0601.2, *UAS Datalink Local Metadata Set*

MISB Standard 0102.5, *Security Metadata Universal and Local Sets for Digital Motion Imagery*

3 Introduction, Intent, and General Implementation Rules

The MISB Minimum Metadata Set consists of metadata elements taken from MISB *Standard 0601* to enable the minimum functionality required for both Discovery & Retrieval of source imagery and the Situational Awareness Product for ISR mission accomplishment. Future versions of the Standard may mandate the use of metadata elements taken from other MISB documents.

The initial MMS was developed jointly by the Motion Imagery Standards Board (MISB), NITFS Technical Board (NTB), NGA Interoperability Action Team (NIAT), and Metadata Focus Group (MFG) with additional subject matter expert input from CENTCOM, NATO Standardization Agreement (STANAG) 4586, and the Unmanned Systems community.

As motion imagery systems begin to migrate to all-digital architectures there are still some systems in transition, which require the consistent preservation of certain analog system characteristics. This Standard identifies a way to encode the original, source-derived metadata from a video sensor into a standard KLV digital metadata set. All metadata ***shall*** be represented using big-endian encoding, *i.e.* the most significant byte (MSB) is first **(R 3.1)**. Bytes ***shall*** be big-endian bit encoding – with the most significant bit (msb) first **(R 3.2)**.

Metadata elements contained in the Minimum Metadata Set ***shall*** be reported no less than once every thirty seconds (30) under all circumstances **(R 3.3)**.

4 MISB Minimum Metadata Set

Elements of the MMS found in *Standard 0601 LDS* are encoded within the UAS Datalink LDS 16 byte SMPTE UL key, which is **`06.0E.2B.34.02.0B.01.01.0E.01.03.01.01.00.00.00` (R 4.1)**.

Table 1 defines the elements from *Standard 0601* that are part of the MISB MMS **(R 4.2)**. Please refer to that document for further information. Note that Tag 48 of *Standard 0601* contains a nested Security Metadata Local Data Set (LDS) as defined in MISB *Standard 0102*. Tag 48 therefore contains sub-tags, indicating specific elements drawn from the Security LDS.

Tag #	Tag Name	Range & Units	Max Size (Bytes)
1	Checksum	Integer	2
2	UNIX Time Stamp	Integer	8
3	Mission ID	String[1]	127
5	Platform Heading Angle	0-360 Degrees[2]	2
6	Platform Pitch Angle	+/- 20 Degrees[2]	2
7	Platform Roll Angle	+/- 50 Degrees[2]	2
10	Platform Designation	String[1]	127
11	Image Source Sensor	String[1]	127
12	Image Coordinate System	String[1]	127
13	Sensor Latitude	+/- 90 Degrees[2]	4
14	Sensor Longitude	+/- 180 Degrees[2]	4
15	Sensor True Altitude	-900 to 19000 m	2
16	Sensor Horizontal FoV	0 to 180 Degrees	2
17	Sensor Vertical FoV	0 to 180 Degrees	2
18	Sensor Rel. Az. Angle	0 to 360 Degrees	4
19	Sensor Rel. El. Angle	+/- 180 Degrees	4
20	Sensor Rel. Roll Angle	0 to 360 Degrees	4
21	Slant Range	0 to 5000000 m	4
22	Target Width	0 to 10000 m	2
23	Frame Center Lat.	+/- 90 Degrees[2]	4
24	Frame Center Lon.	+/- 180 Degrees[2]	4
25	Frame Center El.	-900 to 19000 m	2
48/1	Security Classification	Look Up Table	1
48/2	Classifying Country and Releasing Instructions Country Coding Method	Look Up Table[1]	1
48/3	Classifying Country	String[1]	6
48/4	Security-SCI/SHI Information[3]	String[1]	40
48/5	Caveats[3]	String[1]	32
48/6	Releasing Instructions[3]	String[1]	40
48/12	Object Country Coding Method	Look Up Table	1
48/13	Object Country Codes	String[1]	40
48/22	Security Metadata Version	Integer	2
65	UAS LDS Version	Integer	1

Table 1 - Summary of MMS Tags

[1] For efficient use, it is suggested that strings be limited to a "maximum recommended size" of 20 bytes (Informative)
[2] Includes bit reserved for out of range/no value error message (see STD 0601 for details)
[3] Not required if 48/1 indicates Unclassified data.

5 Requirements Summary

R 3.1: All metadata ***shall*** be represented using big-endian encoding

R 3.2: Bytes ***shall*** be big-endian bit encoding – with the most significant bit (msb) first

R 3.3: Metadata elements contained in the Minimum Metadata Set ***shall*** be reported no less than once every thirty seconds (30) under all circumstances

R 4.1: Elements of the MMS found in *Standard 0601 LDS* are encoded within the UAS Datalink LDS 16 byte SMPTE UL key, which is
`06.0E.2B.34.02.0B.01.01.0E.01.03.01.01.00.00.00`

R 4.2: Table 1 defines the elements from *Standard 0601* that are part of the MISB MMS

Informative Annex A: Bandwidth Impact of MMS Item Size and Frequency

This section addresses the presence and frequency of individual data items within the MISB MMS.

Certain metadata items (strings) may be up to 127 bytes in length. For efficient use, it is suggested that strings be further limited to a "maximum recommended size" of 20 bytes.

Some metadata items change more rapidly than others. When sending metadata in a bandwidth-constrained environment, it is more efficient to dedicate the bulk of the available bandwidth to the rapidly changing values, and include the constant items less often. Guidance is provided here in the form of a "recommended update rate" for each metadata item.

Some of the security metadata items may be omitted, if circumstances permit. The use of Tags 48/4, /5, and /6 are dependent on the value of Tag 48/1 (*e.g.* the Releasing Instructions are meaningless for an Unclassified data asset).

Recommendation Summary for MMS Item Size and Frequency:

1. **Include Tags 3, 10, 11, and the Tag 48 sub-tags once every 10 seconds.**
2. **Limit all strings to 20 bytes.**
3. **Include all other elements as often as possible, within the available bandwidth, and up to the frame rate. This is referred to as the "Fast" rate in Table 2.** [4]

The "Fast" rate varies depending on the available bandwidth of the system, and how frequently the metadata values are refreshed. In some systems it may be desirable to have metadata updated for each video frame. For a specific worked example, see Annex A.

Please note that it is not mandatory to make each and every metadata packet contain every metadata element; this bandwidth study is intended to demonstrate the viability of transmitting the mandatory metadata elements in a bandwidth-constrained environment. If the bandwidth supports it, other metadata packet configurations (more packets each containing fewer elements) are permissible.

[4] It is assumed that the clocks generating the video frames and the metadata are synchronized.

Tag #	Tag Name	Max. Size (Bytes)	Max. Rec. Size (Bytes)	Rec. Update Interval
1	Checksum	2	2	Fast
2	UNIX Time Stamp	8	8	Fast
3	Mission ID	127	**20**	10 s
5	Platform Heading Angle	2	2	Fast
6	Platform Pitch Angle	2	2	Fast
7	Platform Roll Angle	2	2	Fast
10	Platform Designation	127	**20**	10 s
11	Image Source Sensor	127	**20**	10 s
12	Image Coordinate System	127	**20**	10 s
13	Sensor Latitude	4	4	Fast
14	Sensor Longitude	4	4	Fast
15	Sensor True Altitude	2	2	Fast
16	Sensor Horizontal FoV	2	2	Fast
17	Sensor Vertical FoV	2	2	Fast
18	Sensor Rel. Azimuth Angle	4	4	Fast
19	Sensor Rel. Elevation Angle	4	4	Fast
20	Sensor Rel. Roll Angle	4	4	Fast
21	Slant Range	4	4	Fast
22	Target Width	2	2	Fast
23	Frame Center Latitude	4	4	Fast
24	Frame Center Longitude	4	4	Fast
25	Frame Center Elevation	2	2	Fast
48/1	Security Classification[5]	1	1	10 s
48/2	Classifying Country and Releasing Instructions Country Coding Method[5]	1	1	10 s
48/3	Classifying Country[5]	6	6	10 s
48/4	Security-SCI/SHI Information[6]	40	**20**	10 s
48/5	Caveats[6]	32	**20**	10 s
48/6	Releasing Instructions[6]	40	**20**	10 s
48/12	Object Country Coding Method	1	1	10 s
48/13	Object Country Codes	40	**20**	10 s
48/22	Security Metadata Version[5]	2	2	10 s
65	UAS LDS Version	1	1	Fast

Table 2 - Recommended Update Rate and Size Limits for MMS Items

[5] This tag is required within the Security Metadata Set (per MISB Standard 0102.5)
[6] This tag may sometimes be omitted from the Security Metadata Set (see Standard 0102.5 for details).

Informative Annex B: Example MMS Item Rate Calculations

This annex provides bandwidth budget calculations, assuming a 9600 bps channel available for metadata.

Calculations are presented for two general scenarios: the first assumes that each tag is present in each KLV packet, while the second allows for some tags to be sent less frequently than others.

All Tags Always Present Scenario

Worst Case: 18 bytes (Key + Length) + 67 bytes (Tags and Lengths) + 730 bytes (Payload) = 815 bytes = 6520 bits. Assuming serial transmission overhead of 1 start bit and 1 stop bit per byte, there are 8150 bits total. This allows for one metadata update per second at 9600 baud.

Conservative Case: Strings are limited to 40 bytes. Payload reduced to 382 bytes. 467 bytes total = 3736 bits. Serial overhead factor of 1.25 assumed, yielding 4670 bits total. Two metadata updates per second at 9600 baud.

Reasonable Case: Strings limited to 20 bytes. Payload reduced to 224 bytes. 309 total bytes = 2472 bits. Serial overhead factor of 1.25 assumed, yielding 3090 bits total. At 9600 baud, three complete metadata sets can be sent per second (This is a desirable number as it divides 15, 24, and 30 which are commonly used video frame rates).

Variable Rate Tags Scenario

If the data rates of individual metadata elements may be varied, there are more options.

In particular, if the recommend size limits and update rates of section 5 are followed, we have:

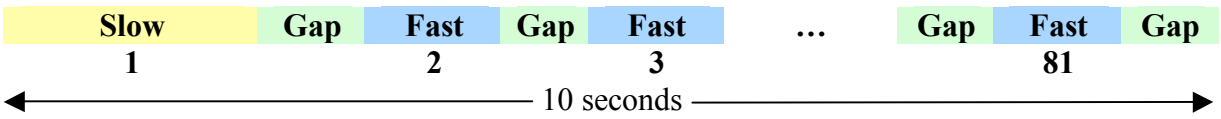
Description	Totals	Fast Packet	Slow Packet
Bytes for Data Fields		59	230
Bytes for Local Set Key & Length		18	18
Bytes for Tags & Lengths		38	67
Bytes to Transmit		115	315
Bits to Transmit		920	2520
Bits for Serial Overhead[7] for 8-N-1		230	630
Bits Sent per KLV Packet		1150	3150
Bits / 10 s Interval @ 9600 Baud	96000		
Bits Remaining After Slow Packet	92850		
Fast Packets / 10 s Interval	80.739		
Whole Fast Packets / 10 s Interval	80		

That is, in a 10-second interval, it is possible to send 1 "slow" MMS packet followed by 83 "fast" MMS packets.

If each packet (fast or slow) is separated by an equal sized gap in time, then:

Description	Value
Whole Fast Packets / 10 s	80
Bits / 10 s @ 9600 baud	96000
Bits / 80 Fast Packets	92000
Bits / 1 Slow Packet	3150
Bits Remaining	850
# of Gaps	81
Bits / Gap	10.49382
Gap Time @ 9600 bps (microseconds)	1093.106996

This packet schedule repeats every 10 seconds. To illustrate:



[7] Assumes serial (RS232 or RS485) transmission with 1 start bit, 0 parity bits, and 1 stop bit for each byte (i.e. 10 bits transmitted for every 8 bits of data).

Informative Annex C: Example MMS Data Packets

This annex constructs hypothetical example MMS data packets, and presents the encoding per MISB Standards 0601.2, 0102.5, and SMPTE 336M-2007. All values are shown for illustration purposes only. The Tag-Length-Value (TLV) encoded data are shown as hexadecimal bytes.

Tag	Name	Value	Interpretation	TLV Hex Bytes
2	UNIX Time Stamp	1,231,798,102,000,000 microseconds	Mon Jan 12 2009 22:08:22 (UTC)	02 08 00 04 60 50 58 4E 01 80
3	Mission ID	Mission 12	Mission 12	03 0A 4D 69 73 73 69 6F 6E 20 31 32
5	Platform Heading Angle	0x71C2	159.9744 Degrees	05 02 71 C2
6	Platform Pitch Angle	0xFD3D	-0.4315251 Degrees	06 02 FD 3D
7	Platform Roll Angle	0x08B8	3.405814 Degrees	07 02 08 B8
10	Platform Designation	Predator	Predator	0A 08 50 72 65 64 61 74 6F 72
11	Image Source Sensor	EO Nose	EO Nose	0B 07 45 4F 20 4E 6F 73 65
12	Image Coordinate System	Geodetic WGS84	Geodetic WGS84	0C 0E 47 65 6F 64 65 74 69 63 20 57 47 53 38 34
13	Sensor Latitude	0x5595B66D	60.17682296 Degrees	0D 04 55 95 B6 6D
14	Sensor Longitude	0x5B5360C4	128.42675904 Degrees	0E 04 5B 53 60 C4
15	Sensor True Altitude	0xC221	14190.72 Meters	0F 02 C2 21
16	Sensor Horizontal FoV	0xCD9C	144.5713 Degrees	10 02 CD 9C
17	Sensor Vertical FoV	0xD917	152.6436 Degrees	11 02 D9 17
18	Sensor Rel. Azimuth Angle	0x724A0A20	160.71921147 Degrees	12 04 72 4A 0A 20
19	Sensor Rel. Elevation Angle	0x87F84B86	-168.79232483 Degrees	13 04 87 F8 4B 86
20	Sensor Rel. Roll Angle	0x00000000	0.0 Degrees	14 04 00 00 00 00
21	Slant Range	0x03830926	68590.98 Meters	15 04 03 83 09 26
22	Target Width	0x1281	722.8199 Meters	16 02 12 81
23	Frame Center Latitude	0xF101A229	-10.54238863 Degrees	17 04 F1 01 A2 29
24	Frame Center Longitude	0x14BC082B	29.15789012 Degrees	18 04 14 BC 08 2B
25	Frame Center Elevation	0x34F3	3216.037 Meters	19 02 34 F3
48	Nested Security Local Set	<All 48/ subtags>	Length of 0x1C includes all subtags.	30 1C
48/1	Security Classification	0x01	UNCLASSIFIED//	01 01 01
48/2	Classifying Country and Releasing Instructions Country Coding Method	0x07	STANAG-1059 Three Letter	02 01 07
48/3	Classifying Country	//USA	//USA	03 05 2F 2F 55 53 41
48/4	Security-SCI/SHI Information	<None>	<None>	
48/5	Caveats	<None>	<None>	
48/6	Releasing Instructions	<None>	<None>	
48/12	Object Country Coding Method	0x07	STANAG-1059 Three Letter	0C 01 07
48/13	Object Country Codes	\u0055\u0053\u0041	USA	0D 06 00 55 00 53 00 41
48/22	Security Metadata Version	1025	MISB Standard 0102.5	16 02 04 01
65	UAS LDS Version	0x02	MISB Standard 0601.2	41 01 02
1	Checksum	0x2972	0x2972	01 02 29 72

Table 3 – Example "Slow" MMS Packet Data

The TLV bytes are appended end-to-end, and together become the value portion of the enclosing KLV packet. In the "slow" example, there are 174 bytes of TLV data - this is encoded as the length of the KLV packet. Lengths as high as 127 may be encoded as the BER short form length (per SMPTE 336M-2007 & Standard 0602.2). Lengths of 128 or higher are encoded as the BER long form length. In this case, 174 is encoded as the BER long form length of 0x81AE.

The whole local set starts with the 16 byte UL key, followed by the length 0x81AE, followed by all the TLV hex bytes above in order. In hex, the whole MMS example "slow" KLV packet is:

```
06 0E 2B 34 02 0B 01 01 0E 01 03 01 01 00 00 00
81 AE 02 08 00 04 60 50 58 4E 01 80 03 0A 4D 69
73 73 69 6F 6E 20 31 32 05 02 71 C2 06 02 FD 3D
07 02 08 B8 0A 08 50 72 65 64 61 74 6F 72 0B 07
45 4F 20 4E 6F 73 65 0C 0E 47 65 6F 64 65 74 69
63 20 57 47 53 38 34 0D 04 55 95 B6 6D 0E 04 5B
53 60 C4 0F 02 C2 21 10 02 CD 9C 11 02 D9 17 12
04 72 4A 0A 20 13 04 87 F8 4B 86 14 04 00 00 00
00 15 04 03 83 09 26 16 02 12 81 17 04 F1 01 A2
29 18 04 14 BC 08 2B 19 02 34 F3 30 1C 01 01 01
02 01 07 03 05 2F 2F 55 53 41 0C 01 07 0D 06 00
55 00 53 00 41 16 02 04 01 41 01 02 01 02 29 72
```

Legend:

Key (16 byte SMPTE Universal Label)
Length (BER short form)
Length (BER long form)
Tag (Local Set Identifier)
Value (interpretation depends on tag data type)

Grid patterned colors have the same meaning as the solid colors, within the nested metadata set.

The next example shows the details of a hypothetical fast MMS data packet.

Tag	Name	Value	Interpretation	TLV Hex Bytes
2	UNIX Time Stamp	1,231,798,102,000,000 microseconds	Mon Jan 12 2009 22:08:22 (UTC)	02 08 00 04 60 50 58 4E 01 80
5	Platform Heading Angle	0x71C2	159.9744 Degrees	05 02 71 C2
6	Platform Pitch Angle	0xFD3D	-0.4315251 Degrees	06 02 FD 3D
7	Platform Roll Angle	0x08B8	3.405814 Degrees	07 02 08 B8
13	Sensor Latitude	0x5595B66D	60.17682296 Degrees	0D 04 55 95 B6 6D
14	Sensor Longitude	0x5B5360C4	128.42675904 Degrees	0E 04 5B 53 60 C4
15	Sensor True Altitude	0xC221	14190.72 Meters	0F 02 C2 21
16	Sensor Horizontal FoV	0xCD9C	144.5713 Degrees	10 02 CD 9C
17	Sensor Vertical FoV	0xD917	152.6436 Degrees	11 02 D9 17
18	Sensor Rel. Azimuth Angle	0x724A0A20	160.71921147 Degrees	12 04 72 4A 0A 20
19	Sensor Rel. Elevation Angle	0x87F84B86	-168.79232483 Degrees	13 04 87 F8 4B 86
20	Sensor Rel. Roll Angle	0x00000000	0.0 Degrees	14 04 00 00 00 00
21	Slant Range	0x03830926	68590.98 Meters	15 04 03 83 09 26
22	Target Width	0x1281	722.8199 Meters	16 02 12 81
23	Frame Center Latitude	0xF101A229	-10.54238863 Degrees	17 04 F1 01 A2 29
24	Frame Center Longitude	0x14BC082B	29.15789012 Degrees	18 04 14 BC 08 2B
25	Frame Center Elevation	0x34F3	3216.037 Meters	19 02 34 F3
65	UAS LDS Version	0x02	MISB Standard 0601.2	41 01 02
1	Checksum	0xC84C	0xC84C	01 02 C8 4C

Table 4 – Example "Fast" MMS Packet Data

Again, the TLV bytes are appended end-to-end, and together become the value portion of the enclosing KLV packet. In the "fast" example, there are 97 bytes of TLV data - this is encoded as the length of the KLV packet. Because the length 97 is strictly less than 128, it is encoded as the BER short form length of 0x61.

The whole local set starts with the 16 byte UL key, followed by the length 0x61, followed by all the TLV hex bytes above in order. In hex, the whole example MMS "fast" KLV packet is:

```
06 0E 2B 34 02 0B 01 01 0E 01 03 01 01 00 00 00
61 02 08 00 04 60 50 58 4E 01 80 05 02 71 C2 06
02 FD 3D 07 02 08 B8 0D 04 55 95 B6 6D 0E 04 5B
53 60 C4 0F 02 C2 21 10 02 CD 9C 11 02 D9 17 12
04 72 4A 0A 20 13 04 87 F8 4B 86 14 04 00 00 00
00 15 04 03 83 09 26 16 02 12 B1 17 04 F1 01 A2
29 18 04 14 BC 08 2B 19 02 34 F3 41 01 02 01 02
C8 4C
```

Legend:

Key (16 byte SMPTE Universal Label)
Length (BER short form)
Tag (Local Set Identifier)
Value (interpretation depends on tag data type)

Informative Annex D: Basis for Metadata Inclusion in MMS

This annex provides motivation for the inclusion of each item in the MMS. Please also note that the metadata tags enumerated herein constitute a *minimum* set to meet two primary ISR missions. Users who need additional elements are encouraged to use other elements from Standard 0601, or other MISB standard elements as appropriate.

In general, the MMS is designed to support two primary missions: Discovery and Retrieval (D&R) and ISR Situational Awareness (ISR SA). The Discovery and Retrieval mission refers to storage of motion imagery within an archive, and in particular subsequent search and access to the archive.

Situational Awareness is defined in the MISP as "the human perception of the elements of the operational environment in the context of forces, space, and time, the comprehension of their meaning, and the projection of their status in the near future." Situational awareness is subjective; it is perhaps easier to define a Situational Awareness Product in objective terms.

The MISP defines a Situational Awareness Product as "a concise, transportable summary of the state of friendly and enemy elements conveyed through information such as full-motion video (FMV), imagery, or other data that can contribute to the development of Situational Awareness either locally or at some distant node."

In other words, a situational awareness product is a collection of those objective, quantifiable pieces of information that assist someone in the formation of situational awareness for a specific context. In the context of ISR, a situational awareness product answers three questions regarding an asset: *who* is it, *where* is it, and *what* is it doing?

Elements from Standard 0601.2 have been chosen as needed to support the D&R and ISR SA tasks, as follows.

CHECKSUM (Tag 1): This element is necessary to ensure that the data contained in an instance of a *Standard 0601.2* set have not been corrupted in some way during transmission.

UAS LDS Version (Tag 65): This element is necessary to ensure that a valid *Standard 0601.2* set can be properly interpreted and parsed.

UNIX Time Stamp (Tag 2): This element is necessary as it fixes the time for which all other elements in a given *Standard 0601.2* set are valid – geospatial information must have a temporal component.

Platform Designation (Tag 10): This element supports both D&R searches and ISR SA regarding the presence of friendly assets.

Image Source Sensor (Tag 11): Since some platforms have multiple sensors, information that specifies what sensor is being used refines the information included under Platform Designation (Tag 10) for both D&R and ISR SA.

Sensor Field of View (H) (Tag 16) and Sensor Field of View (V) (Tag 17): These two elements define the size of the field-of-view of the current sensor. This helps answer a very basic D&R question: Can I see my target with this image (or video clip)? It also contributes to ISR SA by showing what the asset is looking at for a given instant.

The following elements, when taken together with the elements previously described, complete the D&R Mission:

Mission ID (Tag 3): Many searches are done on Mission ID.

Look Angle (Tag 5 and Tag 18 taken together): This is a vital search parameter for observations in mountainous terrain or for viewing obscured targets (or for viewing a particular aspect of a target). Note that the Look Angle is the azimuth between the sensor and the target as seen in a top-down map view - there is no vertical component to this angle.

Image Location (Satisfied either by Tags 23 – 25): These elements either give the center-point of the imaging sensor (which, when combined with the field-of-view elements, defines where the sensor is pointing)

Security Classification / Releasing Instructions Country Coding Method / SCI / Caveats / Releasing Instructions (Tag 48 – Standard 0102.5 Security Metadata Universal and Local Sets for Motion Imagery Sections 4.1.1, 4.1.2, 4.1.4, 4.1.5, 4.1.6) (Tags 48/1, 48/2, 48/4, 48/5, and 48/6): Classification information is required by D&R systems to determine appropriate distribution limits. This is a fundamental requirement of all data in the NSG.

Object Country Coding Method / Object Country Code (Tag 48 – Standard 0102.5 Security Metadata Universal and Local Sets for Motion Imagery Sections 4.1.12 and 4.1.13) (Tags 48/12 and 48/13).: A very basic D&R search is to determine what country is being imaged; it also impacts security/releasability.

Platform Heading Angle (Tag 5), Platform Pitch (Tag 6), Platform Roll (Tag 7): Knowledge of the orientation of an airborne asset is necessary to predict its future position.

Sensor Latitude (Tag 13), Sensor Longitude (Tag 14), Sensor True Altitude (Tag 15): This information is necessary to determine the future position of the sensor.

Sensor Relative Elevation Angle (Tag 19): When combined with information on the orientation of the platform, contributes to understanding what the sensor is or will be able to image.

Slant Range (Tag 21): While this information can be derived from other information on the position and orientation of the platform and a terrain model, an independent measurement of the slant range to the target (or image center) improves confidence in position knowledge.